



INTRODUCTION

ISOTEC implemented an Enhanced In-Situ Dechlorination (EISD) treatment program at a former manufacturing facility in New Jersey to address bedrock groundwater impacted with chlorinated volatile organic compounds (CVOCs), primarily trichloroethene (TCE) and 1,1,1-trichloroethane (1,1,1-TCA). The target treatment area is approximately 21,600 square feet (ft²) with treatment interval from ~20-55 feet (ft) below ground surface (bgs).



Case Study 125

Location: Northern NJ

Contaminants: 1,1,1-TCA, TCE

Lithology: Passaic Formation Bedrock

Treatment Area: ~21,600 ft²

Treatment Interval: 25–55 ft. bgs

Remediation Reagents: Sodium lactate (quick-release donor), small droplet EVO, large droplet EVO with 4 micron ZVI, pH buffer, DHC+DHB bioaugmentation.

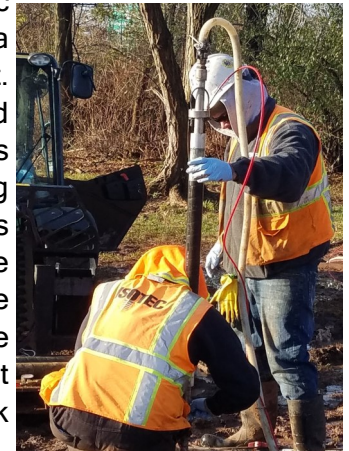
Remediation Results:

- >99% reduction of total CVOCs in injection area
- Lines of evidence of reductive dechlorination >100 feet downgradient
- Sustainable remediation with achieved reduction in CO₂ emissions

ISOTEC TREATMENT PROGRAM

The remediation objectives were to reduce source area CVOC concentrations and establish natural attenuation conditions within and downgradient of the injection area. ISOTEC designed the remediation program using sequential injection of multiple ERD amendments: sodium lactate (QRS™-SL-Plus with nutrients), small-droplet EVO (SRS-SD®), and large-droplet EVO with ZVI (SRS®-ZVI). pH buffers), and bioaugmentation of DHC & DHB.

ISOTEC managed installation of 10 additional open-borehole bedrock injection points to a depth of 55 ft bgs, and fracture depths were identified for targeted injection. The injection program was implemented over 13 days, with a total of 29,440 gallons EISD solutions injected in 12 boreholes through inflatable straddle packers. In addition, 1,200 gallons of anaerobic water and 72 liters of blended bacteria (DHC/DHB) were injected over the event. Injection boreholes were spaced approximately 40 feet apart. EISD reagents were delivered into the subsurface utilizing 2 injection straddle packer set-ups simultaneously to efficiently complete the project in a timely manner. Reagents were injected at an injection low to moderate pressure of 20 to 60 psi to direct remediation solutions into existing network of fractures and bedding planes.

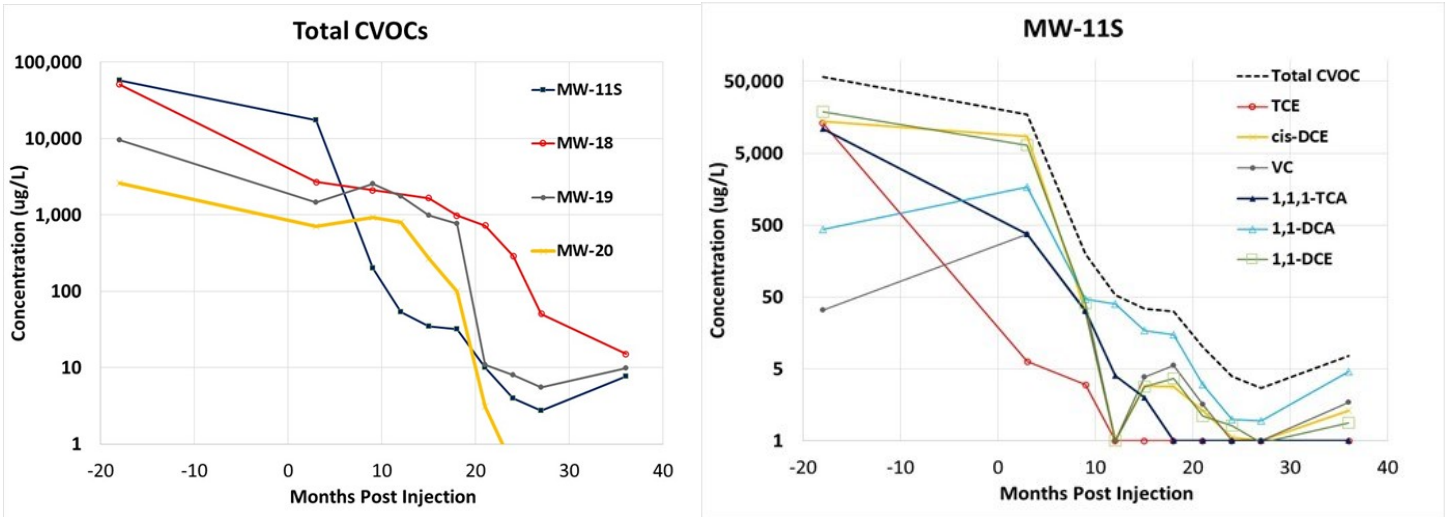


As primary contractor, ISOTEC managed drilling, waste disposal, and site restoration activities.

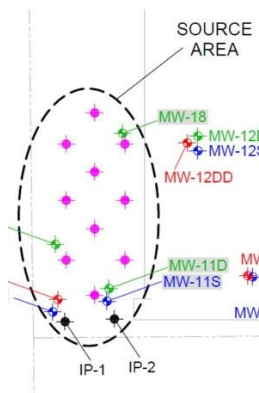
Southern California Center	Southeast Regional Center	Western Regional Center	Northeast Regional Center	Headquarters
San Diego, CA (714) 701-8530	Atlanta, GA (470) 552-3720	Denver, CO (303) 843-9079	Boston, MA (617) 964-0945	Lawrenceville, NJ (609) 275 - 8500

RESULTS

The injection event was completed without any health and safety incidents and on schedule. Remedial amendments were delivered into the bedrock fractures, and injection connectivity was observed in surrounding injection and monitoring boreholes. In all wells in the active treatment vertical interval total CVOC concentrations were reduced by more than 99% (two to four orders of magnitude) comparing baseline in samples 24 months post injection, and ongoing downward trends were observed 12 to 36 months post-injection. The most contaminated well at based had total CVOC concentrations reduce from 57,500 $\mu\text{g/L}$ to less than 5 $\mu\text{g/L}$. Reductive dechlorination lines of evidence were observed in monitoring wells 90 to 200 feet from the injection area 18 to 24 months after injection, including increases in dissolved iron, decrease in sulfate, detection of lesser chlorinated VOCs, and decrease in total CVOC concentrations.



ISOTEC implemented sustainable remedial practices into the program, including purchasing amendments from Zero Carbon Footprint Certified manufacturer, a no-idling policy, assessment of staff commuting and utilizing a hybrid vehicle for carpooling, recycling of totes, and using locally sourced subcontractors (water, frac tank, forklift, driller), which attained an potential reduction of carbon dioxide emissions of approximately 8 metric tons compared to the same remediation program with



Southern California Center	Southeast Regional Center	Western Regional Center	Northeast Regional Center	Headquarters
San Diego, CA (714) 701-8530	Atlanta, GA (470) 552-3720	Denver, CO (303) 843-9079	Boston, MA (617) 964-0945	Lawrenceville, NJ (609) 275 - 8500